

Remarks

Claims 1-10, 13 and 14 were pending.

Claim 1 is amended.

Claims 3, 5 and 9 are original.

Claims 2, 4, 6-8, 13 and 14 are as previously presented.

Claim 10 is cancelled.

Claims 15-23 are new.

Claim 1 is amended to reword the third and fourth lines which had read "(a) heating of a compound of the formula (II) under microwave irradiation optionally ..." to now read "(a) microwave irradiation of a compound of the formula (II) optionally". Support is inherent in the claims.

Claims 15-23 are supported by claims 1-7, 13 and 14 and mirror those claims except that material wherein A¹ and A² are other than a substituted or unsubstituted carboxylic aryl group and/or wherein A³ is heteroaryl is deleted. Applicants believe that these claims represent the material described on page 4 of the present action as material elected under the Examiner's restriction.

No new matter is added.

As stated in their previous amendment Applicants respectfully disagree that the restriction was warranted. Applicants again respectfully point out that no compounds are claimed, only a novel and strikingly different and effective method for preparing certain heterocycles. According to PCT, unity of invention is present when there is a "technical relationship" among the claimed inventions involving one or more of the same or corresponding "special technical features." The expression "special technical features" means those technical features that define a contribution which each of the claimed inventions, considered as a whole, makes over the prior art.

Page 3 of the Action, states that the technical feature of the instant claims is the compound of formula 1 and not the process. Applicants respectfully disagree. The special technical feature, which is common to all remaining claims, is the process of carrying out the conversion of compound II to compound I under microwave radiation, not the compounds I or a particular substitution pattern. The different values for A¹, A² and A³ found among the compounds of formula I do not play a role in this and thus claims 1-9, 13 and 14 are presently left substantially intact. Applicants kindly ask that the Examiner rejoin all the material upon finding the elected process (claims 15-23) allowable.

It is also stated that the various subclasses would require separate searches. However, Annex B of the MPEP relating to unity of invention, for example, section (f) "Markush Practice", in particular paragraph (iii) states that ' the words "recognized class of chemical compounds" mean that there is an expectation from a knowledge in the art that members of a class will behave in the same way within the context of the claimed invention'. Same section paragraph (iv), "The fact that the alternatives of a Markush grouping can be differently classified shall not, taken alone, be considered to be justification for finding a lack of unity of invention."

Applicants believe that the classification of the various substituents are not relevant given that there is an expectation that all the process of the invention will behave in substantially the same way for each of the compounds with all the claimed values within the context of the claimed invention.

The basis for the rejections in the instant Action and the basis for the restriction requirement are intertwined. That is, Applicants are asked to demonstrate that the process step of the instant invention constitutes a significant, novel and unexpected contribution to the art and that the patentable process can constitute a linking technical feature.

Page 8 of the present Action states that the only difference between the instant invention and cited art US Application No. 10/485,840 is the method of heating and page 13 of the Action states that merely modifying processing conditions such as temperature is not a patentable modification absent a showing of criticality. Richter et.al. is cited to show that microwave heating is known as an efficient heating method in sample preparation.

Applicants respectfully point to the bottom paragraph of page 1 of the Specification: It has now surprisingly been found, that the 3,6-diphenylfuro[3,4-c]pyrrole-1,4-diones (furopyrroles) of formula I can be obtained in higher yield by carrying out the above reaction under microwave radiation. The yield of the ring closure of ethyl 4-benzoyl-4,5-dihydro-5-oxo-2-phenylpyrrole-3-carboxylate to 3,6-diphenylfuro[3,4-c]pyrrole-1,4-dione is, for example, **increased from 40 to 86 % by the microwave assisted process** according to the present invention. Moreover, we have observed that the preparation of this lactone (a versatile DPP precursor) **requires lesser time (1 to 10 minutes) under microwave irradiation while ring closure of the compound of formula II takes 60 hours when conducted without microwave radiation** (conventional method). In addition, the solvent can be omitted in the microwave assisted ring closure, which makes the above process further cost effective.

Applicants respectfully submit that an increase in yield of 40 to 86% and a reduction in reaction time of 60 hours to 10 minutes represent a surprising improvement regardless of what process modification lead to the improvement. Applicants also note that the improvements are described as occurring in "the microwave assisted process" suggesting that more than simple bulk heating of a reaction mixture is involved. To reinforce this, claim 1 is amended to delete the term "heating" and to more accurately describe the reaction as one which occurs under "microwave irradiation" to more clearly reflect the essence of the reference page 1 paragraph "...carrying out the above reaction under microwave radiation"

Applicants submit that the enormous improvements in yield and time are well outside what one could expect from simple altering the process of heating and further submit that these dramatic improvements can be considered a "showing of criticality" rendering the instant process patentable.

Applicants respectfully aver that Richter describes only the process of preparing analytical samples which involves the digestion of analytical samples, in particular, the digestion of materials in mineral acid. As impressive as the examples in Richter may be, Applicants submit that the ring closing reaction found in the instant invention represents a reaction quite different from the decomposition of bio material in an acid. The vast improvement in yield in the instant ring closing process demonstrates a great deal of specificity in the reaction. The digestion reactions of Richter represent a much different, less selective process.

Applicants also respectfully submit that the application of methods for producing small analytical samples are frequently not applicable to the large scale preparation of organic compounds. In the instant case, a method for manufacturing commercial quantities of dyes has been discovered which offers significant advantages in both cost and environmental impact, e.g., no solvents, less waste due to higher yield, less energy consumption.

Objections

Claims 1-10, 13 and 14 are objected to for containing non-elected subject matter. Applicants have included new claims 15-23 which represent claims where the non-elected matter has been deleted. Applicants kindly ask the Examiner's indulgence for not deleting this material from claims 1-9, 13 and 14, (claim 10 has been cancelled) because Applicants hope to convince the Examiner that the material therein should be rejoined.

Should the Examiner disagree with Applicants that the material of claims 1-9 should be rejoined at this point, Applicants kindly ask that the Examiner begin the examination with claims 15-23 and upon finding claims 15-23 allowable, rejoin claims 1-9, 13 and 14.

Rejections

Claims 1-7, 13 and 14 are provisionally rejected on the ground of non-statutory obviousness type double patenting over US Application No. 10/485,840.

Claims 1-10, 13 and 14 are rejected under 35 USC 103(a) over Morton, et.al., WO 03/022848.

Applicants respectfully traverse the rejections.

Neither of the cited pieces of art disclose the process of the instant invention. As stated above, it has been found that microwave irradiation can double the yield of obtained in forming compounds of formula I and provides an enormous reduction in reaction time when compared to a process where the compound of formula II is heated using conventional means. Applicants believe that this suggests that there is some significant change in how the reaction proceeds in the presence of microwave irradiation and have amended claim 1 to reinforce that. Nonetheless, Applicants respectfully aver that the improvements found are highly significant and the improvements, in particular the yield improvements for this ring closure reaction, could not be anticipated by any combination of the art. The disclosure of Richter, not specifically cited in the 103(a) rejections but already of record, of efficient digestion of bio-materials in acid media, as discussed above, does not suggest such improvements in a large scale, selective preparation of an organic compound.

The instant claims are only to a novel process and not to compounds, the microwave induced ring closure reaction of compounds of formula II to compounds of formula I has never been previously disclosed, and the microwave induced reaction is unexpectedly superior the ring closure reactions under previously disclosed processes in several ways.

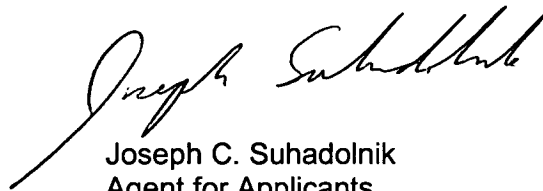
Therefore, Applicants respectfully submit that there is no prima facie case for obviousness over the art and that the present process provides significant and unexpected improvements that constitute a patentable modification over the cited art and kindly ask that the Examiner withdraw the rejections at least in how they relate to claims 15-23 and find claims 15-23 allowable.

Applicants respectfully aver that carrying out the reaction of compound II to compound I under **microwave radiation** is a special technical feature, which is common to all claims and defines a significant contribution to the art as detailed above. Applicants maintain that the determination of contribution to the art is not related to the specific substitution pattern of the compounds of formula I, but to the inventive, ring closing process.

Upon finding the process of claims 15-23 allowable, Applicants further kindly ask that the Examiner rejoin claims 1-9, 13 and 14, withdraw the rejections and find these claims also allowable.

In light of the above discussion and amendments, Applicants respectfully submit that all rejections are overcome and kindly ask the examiner to withdraw all rejections and find claims 1-9, 13, and 14-23 allowable. In the event that minor amendments will further prosecution, Applicants request that the examiner contact the undersigned representative.

Respectfully submitted,



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